Explainable AI via Argumentation:
Theory & Practice

Antonis Kakas

University of Cyprus, Cyprus

Nikos Spanoudakis

Technical University of Crete, Greece

Co-founders of Argument Theory

https://www.argument-theory.com/

ESSAI 2024 School: 22-26 July, Athens

Course Contents & Structure

- **Argumentation Theoretical Concepts & Methodologies**
  - **Lecture 1 – Overall Exposition.**

- **Hands on Development** of XAI Arg-based system(s)
  - **Lecture 1 – Student start their Choice of Problem**
  - **Lecture 2 – Argumentation in Practice & Technology**
    - **GORGIAS and RAISON**
  - **Lecture 3 & 4 – Further Study of Practice of Argumentation**
    - **Student Systems development**
  - **Lecture 4 & 5 – Student Presentations**

- **Brief Exposition** of Advanced Topics - Lecture 5
  - **Explainable Machine Learning via Argumentation: ArgEML**
  - **Argumentation in Natural Language: COGNICA with LLM**

Lecture 1

- **Motivation**
  - **Explainable AI (XAI) & Why Argumentation for XAI?**

- **Theory of Argumentation**
  - **Validity of Argument**
  - **Argumentative Reasoning**

- **Argumentation in Practice**
  - **Structured Argumentation** **for Knowledge Representation.**
  - **Gorgias** **Argumentation Framework.**
  - **Preview:** **Basics of a Methodology for Contextual Knowledge Acquisition**

- **Preview: Building Arg-based Systems**
  - **High-level Systems Architecture**
  - **Arg-based Technology – Systems and Authoring Tools**

- **Start of hands-on Development**
  - **Students choose their own application problem.**
  - **Open accounts in Gorgias Cloud**

Lecture 2

- ❑ **Methodology for Contextual Knowledge Acquisition**
  - ■ *SoDA:* **Software Development via Argumentation**
  - ■ From **Natural Language** Specs to **Scenario-based Preferences**

- ❑ **Scenario-based Preferences to Gorgias Argumentation**
  - ■ **Translation of SBPs to Argumentation & Gorgias Programs**
  - ■ **Presentation of Gorgias Cloud: Code, Queries & Explanations.**

- ❑ **Preview: Authoring Scenario-based Preferences**
  - ■ **rAIson platform & simple example highlights**

- ❑ **Hands-on Development**
  - ■ **Gorgias Cloud exercises to code up simple problems**
  - ■ **Student presentation of their chosen application problem.**

4

Lecture 3

- **rAIson platform presentation**
  - **Example problems**
  - **Clarification of problem specification**
  - **Revision of problem specification**

- **Hands-on Development**
  - **Open student projects** in **rAIson**.
  - **Discussion** of SBPs for student problems.

Lecture 4

- **Hands-on Development in Class**
  - **Students author their problem in rAIson**
  - **Test their Decision Policy representation**
  - **Extend the specification of their policy.**

- **Support with rAIson in class**

Lecture 5

- **Hands-on Development**
  - **Presentation** of student solutions.
  - **Guidance** for future development.

- **Advanced Topics**
  - **Direct Authoring in Natural Language:**
    - **COGNICA with LLM**
  - **Explainable ML:**
    - **ArgEML: Reading**